

Control of a Measles Outbreak in an Elementary School

Baltimore County, Md., 1975

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AN OUTBREAK of 16 cases of measles occurred between April 18 and May 20, 1975, among the 422 pupils in a Baltimore County elementary school. Another case occurred during this period in a sibling who attended junior high school. This was the first recognized outbreak of measles in Maryland in more than a year. It was traced to a 16-year-old Pennsylvanian who became ill with symptoms of measles while visiting the first patient in Maryland on April 5 and 6. The index patient first exhibited a measles rash on April 18. Nine second-generation cases occurred 10 to 18 days later, and seven third-generation cases occurred

27 to 33 days after the first case (see chart). The principal of the elementary school reported the outbreak to the county health officer on May 5, when five of the second-generation cases were recognized by the elementary school nurse. A cooperative investigation was promptly initiated by the school and the county and State health departments.

Investigation

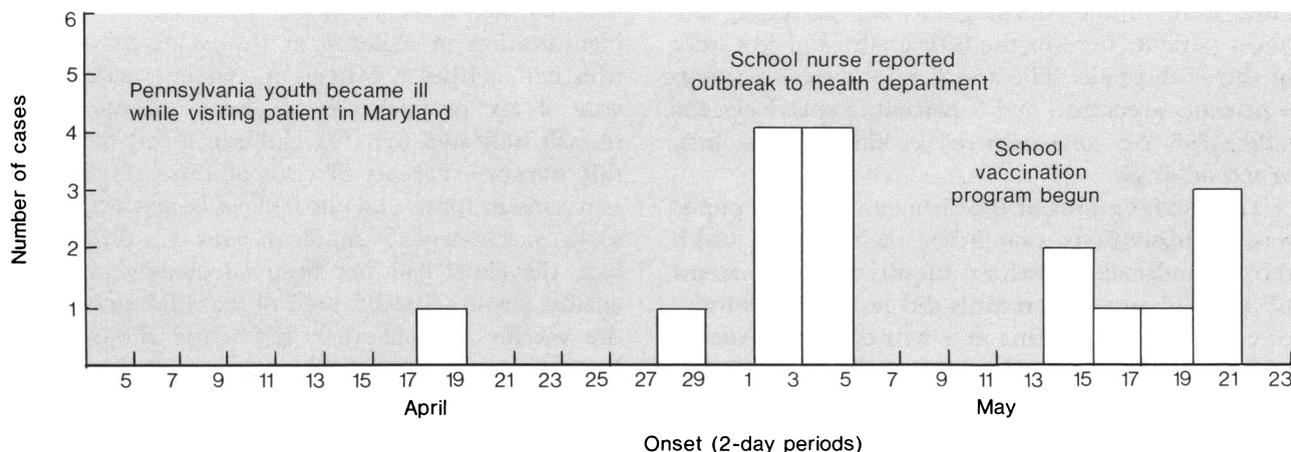
Casefinding procedures, begun May 5, consisted of periodic telephone calls to 10 physicians practicing in the neighborhood and investigation of contacts

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the time of this investigation. Mr. Manear is a health services specialist, Maryland Department of Health, and Mr. Bobbitt is a public health advisor of the Immunization Division, assigned to that department.

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Date of onset of rash in 17 measles cases in Baltimore County, Md., 1975



and of children absent from school for 2 consecutive days. Parents of absent children and contacts were questioned about signs and symptoms of measles through a 17-day incubation period after an identified exposure to a known case. A case was defined as the presence of a morbilliform rash lasting 3 or more days, fever, and, if tests were made, a convalescent complement-fixing (CF) antibody titer to measles virus greater than 1:8. In addition to fever and rash, the most frequently reported symptoms and signs of the 17 patients were red, watery eyes (16), cough (15), runny nose (11), sore throat (10), photophobia (10), lymphadenopathy (8), and Koplik spots (5). Twelve of the patients were seen by physicians, but none was hospitalized or had serious complications.

Serum samples were obtained during the acute and convalescent phases of illness from 15 of the measles patients. Eleven patients showed at least a fourfold rise in CF measles antibody titer. The paired samples from the four other patients had unchanging CF titers: $\geq 1:256$ (one patient), 1:128 (one patient), and 1:64 (two patients). Additional serologic evidence of acute measles infection in the last two patients included a hemagglutination-inhibition (HI) measles antibody titer of $\geq 1:128$ (one patient) and detectable measles-specific IgM antibody (one patient). Single serum specimens were collected from two patients; the CF measles titer for one, on the sixth day of illness, was 1:128, and for the other, on the third day of illness, was $< 1:8$. Thus, 16 of the 17 cases in this outbreak were confirmed serologically by a measles CF titer of at least 1:64. Four other pupils with rashes were not counted as measles patients because their convalescent HI and CF antibody titers to measles virus were $\leq 1:8$.

To determine whether the incidence of measles varied with age, we looked at the age and grade level of the children with the disease. The 16 pupils with measles in the elementary school ranged from 8 to 12 years old. Two patients were in the third grade, three were in the fourth grade, six, including the index patient, were in the fifth grade, and five were in the sixth grade. The attack rates were 3 percent, 4 percent, 7 percent, and 8 percent, respectively, for grades 3–6. No cases occurred in kindergarten, first, or second grade.

The vaccine status of the elementary school pupils was established by examining their school health records and making written inquiries to the parents of all children whose records did not show a history of either measles vaccine at 1 year of age or later or of measles disease. Of the 442 pupils, 377 (85.3 percent) had a documented history of measles vaccine at

1 year of age or older, 32 (7.2 percent) had received their only vaccine at age 10 or 11 months, 18 (4.1 percent) had been immunized before 10 months of age, and 15 (3.4 percent) had no definite history of vaccine. Of this last group, 10 gave a history of disease and only 1 gave a definite history of no vaccine or disease. The measles attack rates according to immunization status were as follows:

<i>Immunization history</i>	<i>Number of pupils</i>	<i>Number of cases</i>	<i>Attack rate (percent)</i>
Vaccine at 1 year of age or later	377	8	2.1
Vaccine at 10 or 11 months of age	32	0	0
Vaccine at less than 10 months of age	18	5	27.8
No definite history of vaccine	15	13	20.0
Total	442	16	3.6

¹ Includes 2 with history of disease.

These data reveal that the measles attack rate was 13 times higher in children vaccinated before 10 months of age and 10 times higher in those with no history of vaccination than in children who had received vaccine after 1 year of age. Even if children from grades without cases of measles are excluded from the analysis, the attack rate among children vaccinated before 10 months of age is still 13 times higher than the rate among children vaccinated after the age of 1.

The 16 measles patients in the elementary school had 31 siblings under 16 years of age, all of whom had a history of vaccination or disease. Nevertheless, one sibling contracted measles; he was 14 years old, a student of a local junior high school, and had received measles vaccine when he was 5 years old. Intensive surveillance revealed no spread of the disease at the junior high school.

Control Measures

The first step taken to control this outbreak was the identification of children at the elementary school who had neither a history of measles vaccine at 1 year of age or later nor of disease. School health records indicated that 113 children might belong in this category. Parents of each of these pupils were sent consent forms and encouraged to allow the child to be vaccinated at school on May 12, 1975, if, in fact, the child had not been adequately protected against measles. Parents of 57 of the children declined the vaccine because, they said, their children had been vaccinated after 1 year of age, and the parents of 23 declined for medical, religious, or unstated

reasons. The parents of the remaining 33 signed the consent forms, and the children were given the vaccine. Two of these 33 children subsequently became ill with measles; the onset of rash in one was 2 days after vaccination, and the onset in the other was 8 days after.

The second control measure was to publicize the outbreak through the news media and by telephone calls to private physicians. Because one child became ill with measles on the day she attended a Greek Easter service, the priest was asked to mention the outbreak at church the next week. Parents and physicians were advised to immunize all children under their care who were not adequately protected and to report all suspected cases of measles to the county health department.

The third control measure was to administer vaccine to 37 students and 1 teacher at the local junior high school. As in the elementary school, we identified students needing the vaccine in the junior high school by reviewing school health records and sending letters to parents of children whose immunization status was uncertain.

Discussion

This outbreak of measles demonstrates the necessity of maintaining high levels of immunity among all children in order to prevent epidemics. It also demonstrates the importance of maintaining complete and accurate school health records. The identification of 113 elementary school pupils whose records failed to provide evidence of either measles disease or adequate vaccination suggests a need to update school health records across the country, as well as to improve immunization levels.

The substantially higher attack rate for children who had been vaccinated only when they were under 10 months of age supports the 1972 recommendation of the Public Health Service Advisory Committee on Immunization Practices that children vaccinated before this age need to be revaccinated with live measles virus to assure full protection (1). In 1976, this committee broadened its recommendation to include revaccination of children who received vaccine when under 12 months of age (2). It also recommended in this statement that for maximum efficacy vaccine be administered when children are about 15 months old.

Among the 15 children in the elementary school who had no definite history of ever having received vaccine, were 10 who gave a history of measles disease; 2 of these 10 contracted measles in this outbreak. These data suggest that in a population that has previously had a low incidence of wild virus measles a history of measles is not a totally reliable indicator of immunity.

The importance of prompt reporting of measles cases to the local health department so that effective control measures can be initiated was illustrated in this outbreak. Prevention of a fourth generation of cases and spread of measles in the community is attributed both to the high initial levels of immunity in the county and to the prompt initiation of control measures.

References

1. Center for Disease Control: Immunization against disease, 1972. Atlanta, Ga., 1972, p. 97.
2. Center for Disease Control: Recommendations of the Public Health Service Advisory Committee on Immunization Practices. Measles vaccine. Morbidity—Mortality Weekly Rep 25: 359-365, Nov. 19, 1976.

SYNOPSIS

MULLEN, JOHN R. (Arizona Department of Health Services), SCHONBERGER, LAWRENCE B., MANEAR, FRANCIS L., and BOBBITT, WAYNE R.: *Control of a measles outbreak in an elementary school. Baltimore County, Md., 1975. Public Health Reports, Vol. 92, May-June 1977, pp. 217-219.*

Between April 18 and May 20, 1975, 16 cases of measles occurred in pupils in an elementary school in Baltimore County, Md., and 1 case occurred in a sibling at a junior

high school. Measles was serologically confirmed in 16 of these pupils. Attack rates were determined by grade and by vaccine status.

The measles attack rate was 2.1 percent for the 377 children who had been given measles vaccine at 1 year of age or later. The rates were 27.8 percent (13 times higher) for those vaccinated at less than 10 months of age and 20.0 percent (10 times higher) for those with no definite history of vaccine.

The higher attack rates for children who were vaccinated only be-

fore 10 months of age supports the 1972 recommendation of the Public Health Service Advisory Committee on Immunization Practices that children vaccinated before this age need to be revaccinated with live measles virus vaccine to assure full protection. The finding that 2 of 10 children with a history of measles became ill during the outbreak suggests that such histories are not a totally reliable indicator of immunity.

Containment of the outbreak was attributed to the high level of immunity in the community and prompt initiation of control measures.